

Amendment and Response

Applicant: Mark Hirst et al.

Serial No.: 10/685,322

Filed: October 14, 2003

Docket No.: 200309706-1

Title: IMAGING DEVICE COOLING SYSTEM

IN THE CLAIMS

Please amend claims 1, 7, 10, 12, 17, 19, and 44-46 as follows:

1. (Currently Amended) A cooling system in ~~an~~ a print imaging device having an element that generates heat, the cooling system comprising:
 - a thermoelectric generator thermally coupled to the element to convert heat from the element to electrical energy; and
 - a cooling device powered by the electrical energy to thereby cool the print imaging device.
2. (Original) The cooling system of claim 1, wherein the heat generating element comprises a print element.
3. (Original) The cooling system of claim 1, further comprising:
a controller adapted to receive and configured to monitor a level of electrical energy from a power supply internal to the imaging device, configured to receive the electrical energy from the thermoelectric generator, and configured to cause the cooling device to be normally powered by the electrical energy from the power supply and to be alternately powered by the electrical energy from the thermoelectric generator upon detecting the level of electrical energy from the power supply is substantially at or below a threshold level.
4. (Original) The cooling system of claim 3, wherein the threshold level is substantially equal to zero.
5. (Original) The cooling system of claim 3, wherein the controller is further configured to cause the cooling device to be alternately powered by the electrical energy from the thermoelectric generator upon detecting that electrical energy from the thermoelectric generator is at a level greater than the level of electrical energy from the power supply.

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6. (Original) The cooling system of claim 1, wherein the thermoelectric generator comprises:

a Peltier device operating in a Seebeck mode.

7. (Currently Amended) The cooling system of claim 42, wherein a first surface of the thermoelectric generator is mechanically coupled and thermally coupled to a housing of the imaging device and a second surface is thermally coupled only to the print element to thereby allow removal of the print element from the imaging device.

8. (Original) The cooling system of claim 7, wherein a heat conducting elastomer has a first major surface adhered to the second surface of the thermoelectric generator and a second major surface that contacts the print element.

9. (Original) The cooling system of claim 1, wherein the electrical energy comprises a voltage.

10. (Currently Amended) The cooling system of claim 1, wherein the cooling device is configured to reduce the temperature of the ~~imaging device print element~~.

11. (Original) The cooling system of claim 1, wherein the cooling device comprises at least one exhaust fan to generate an air flow.

12. (Currently Amended) An ~~print~~ imaging system comprising:

a heat source; and

a cooling system comprising:

a thermoelectric generator thermally coupled to the heat source to convert heat from the heat source to electrical energy; and

a cooling device powered by the electrical energy to thereby cool the ~~print~~ imaging system.

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13. (Original) The imaging system of claim 12, wherein the cooling system further comprises:

a controller adapted to receive and configured to monitor a level of electrical energy from a power supply internal to the imaging system, configured to receive the electrical energy from the thermoelectric generator, and configured to cause the cooling device to be normally powered by the electrical energy from the power supply and to be alternately powered by the electrical energy from the thermoelectric generator upon detecting the level of electrical energy from the power supply is substantially at or below a threshold level.

14. (Original) The imaging system of claim 13, wherein the threshold level is substantially equal to zero.

15. (Original) The imaging system of claim 13, wherein the controller is further configured to cause the cooling device to be alternately powered by the electrical energy from the thermoelectric generator upon detecting that electrical energy from the thermoelectric generator is at a level greater than the level of electrical energy from the power supply.

16. (Original) The imaging system of claim 12, wherein the heat source comprises a print element.

17. (Currently Amended) The imaging system of claim ~~12~~¹⁶, wherein the print element comprises a fuser.

18. (Original) The imaging system of claim 12, wherein the thermoelectric generator comprises:

a Peltier device operating in a Seebeck mode.

19. (Currently Amended) The imaging system of claim 12, wherein a first surface of the thermoelectric generator is mechanically coupled and thermally coupled to a housing of the print imaging system and a second surface is thermally coupled only to the heat source.

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20. (Original) The imaging system of claim 19, wherein a heat conducting elastomer has a first major surface adhered to the second surface of the thermoelectric generator and a second major surface that contacts the heat source.

21. (Original) The imaging system of claim 12, wherein the electrical energy comprises a voltage.

22. (Original) The imaging system of claim 12, wherein the cooling device is configured to reduce the temperature of the imaging system heat source.

23. (Original) The imaging system of claim 12, wherein the cooling device comprises at least one exhaust fan that generates an air flow.

24. (Original) A laser printer comprising:

a fuser that generates heat; and

a cooling system comprising:

 a thermoelectric generator thermally coupled to the fuser to convert heat from the fuser to electrical energy; and

 a cooling device powered by the electrical energy to thereby cool the laser printer.

25. (Original) The laser printer of claim 24, wherein the cooling system further comprises:

 a controller adapted to receive and configured to monitor a level of electrical energy from a power supply internal to the laser printer, configured to receive the electrical energy from the thermoelectric generator, and configured to cause the cooling device to be normally powered by the electrical energy from the power supply and to be alternately powered by the electrical energy from the thermoelectric generator upon detecting the level of electrical energy from the power supply is substantially at or below a threshold level.

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26. (Original) The laser printer of claim 25, wherein the threshold level is substantially equal to zero.

27. (Original) The laser printer of claim 25, wherein the controller is further configured to cause the cooling device to be alternately powered by the electrical energy from the thermoelectric generator upon detecting that electrical energy from the thermoelectric generator is at a level greater than the level of electrical energy from the power supply.

28. (Original) The laser printer of claim 24, wherein the thermoelectric generator comprises:

a Peltier device operating in a Seebeck mode.

29. (Original) The laser printer of claim 24, wherein the thermoelectric generator has a first surface mechanically coupled and thermally coupled to a housing of the laser printer and a second surface thermally coupled only to the fuser to thereby allow removal of the print fuser from the imaging device.

30. (Original) The laser printer of claim 29, wherein a heat conducting elastomer has a first major surface adhered to the second surface of the thermoelectric generator and a second major surface that contacts the fuser.

31. (Original) The laser printer of claim 24, wherein the electrical energy comprises a voltage.

32. (Original) The laser printer of claim 24, wherein the cooling device is configured to reduce the temperature of the fuser.

33. (Original) The laser printer of claim 24, wherein the cooling device comprises at least one exhaust fan that generates an air flow.

34. (Original) A fuser system comprising:

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a fuser assembly that generates heat; and

a cooling system comprising:

a thermoelectric generator thermally coupled to the fuser to convert heat from the fuser to electrical energy; and

a cooling device powered by the electrical energy to thereby cool the fuser assembly.

35. (Original) The fuser system of claim 34, wherein the cooling system further comprises:

a controller adapted to receive and configured to monitor a level of electrical energy from a power supply, configured to receive the electrical energy from the thermoelectric generator, and configured to cause the cooling device to be normally powered by the electrical energy from the power supply and to be alternately powered by the electrical energy from the thermoelectric generator upon detecting the level of electrical energy from the power supply is substantially at or below a threshold level.

36. (Original) The fuser system of claim 35, wherein the threshold level is substantially equal to zero.

37. (Original) The fuser system of claim 35, wherein the controller is further configured to cause the cooling device to be alternately powered by the electrical energy from the thermoelectric generator upon detecting that electrical energy from the thermoelectric generator is at a level greater than the level of electrical energy from the power supply.

38. (Original) The fuser system of claim 34, wherein the thermoelectric generator comprises:

a Peltier device operating in a Seebeck mode.

39. (Original) The fuser system of claim 34, wherein the thermoelectric generator has a first surface mechanically coupled and thermally coupled to a housing of the laser printer and

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a second surface thermally coupled only to the fuser to thereby allow removal of the print fuser from the imaging device.

40. (Original) The fuser system of claim 39, wherein a heat conducting elastomer has a first major surface adhered to the second surface of the thermoelectric generator and a second major surface that contacts the fuser.

41. (Original) The fuser system of claim 34, wherein the electrical energy comprises a voltage.

42. (Original) The fuser system of claim 34, wherein the cooling device is configured to reduce the temperature of the fuser.

43. (Original) The fuser system of claim 34, wherein the cooling device comprises at least one exhaust fan that generates an air flow.

44. (Currently Amended) A method of cooling ~~ana print~~ imaging device comprising:
converting heat generated by the imaging device to electrical energy; and
powering a cooling device with the electrical energy.

45. (Currently Amended) The method of claim ~~35~~44, further comprising:
positioning a thermoelectric generator so as to have a first surface thermally coupled to a heat source within the ~~print~~ imaging device and a second surface thermally coupled to a housing of the ~~print~~ imaging device, wherein the thermoelectric generator converts heat from the heat source to the electrical energy.

46. (Currently Amended) The method of claim ~~36~~45, further comprising:
positioning the cooling device proximate to the heat source to reduce the temperature of the heat source.

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47. (Original) A cooling system in an imaging device having a print element that generates heat, the cooling system comprising:

a means for converting heat generated by the print element to electrical energy; and
means for cooling the imaging device that is powered by electrical energy.